

**AMENDMENTS TO THE CLAIMS**

Please **CANCEL** claims 1-8 without prejudice or disclaimer in favor of presentation of this subject matter in a divisional application.

Please **AMEND** claim 21 as shown below.

This listing of claims will replace all prior versions, and listings, of claims in the application.

1-8. (Canceled)

9. (Previously Presented) A positive active material composition for a lithium-sulfur battery, comprising:

a positive active material comprising sulfur or a sulfur-based compound;

a conductive agent;

an organic solvent;

a binder comprising a butadiene-based copolymer, wherein the binder is distributed in the organic solvent to form an emulsion, the binder having particle sizes of 15 micrometers or less; and

an agent for controlling viscosity.

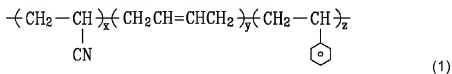
10. (Original) The positive active material composition of claim 9, wherein the binder is presented in the amount of 2 to 6% by weight of the positive active material composition.

11. (Original) The positive active material composition of claim 10, wherein the binder is presented in the amount of 2 to 3% by weight of the positive active material composition.

12. (Original) The positive active material composition of claim 9, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene copolymer, an acrylonitrile-butadiene copolymer, and a modified styrene-butadiene copolymer.

13. (Original) The positive active material composition of claim 12, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene rubber, an acrylonitrile-butadiene rubber, and a modified styrene-butadiene rubber.

14. (Original) The positive active material composition of claim 9, wherein the butadiene-based copolymer is represented by Formula 1:



and wherein:

when x is 0, y ranges from about 5 to about 40, and z ranges from about 60 to about 95;

when z is 0, x ranges from about 60 to about 95 and y ranges from about 5 to about 40;

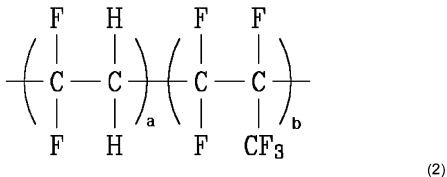
and

when x, y, and z do not equal 0, x ranges from about 20 to about 75, y ranges from about 5 to about 20, and z ranges from about 20 to about 75.

15. (Original) The positive active material composition of claim 9, wherein the butadiene-based copolymer is non-aqueous.

16. (Original) The positive active material composition of claim 9, further comprising a fluorine-based polymer.

17. (Original) The positive active material composition of claim 16, wherein the fluorine-based polymer is represented by Formula 2:



and wherein a ranges from about 0.5 to about 1.0, and b ranges from about 0 to about 0.5.

18. (Original) The positive active material composition of claim 16, wherein the fluorine-based polymer is selected from the group consisting of a homopolymer prepared from monomers selected from the group consisting of  $\text{C}_2\text{F}_3\text{Cl}$ ,  $\text{C}_2\text{H}_3\text{F}$  and  $\text{CH}_3(\text{CF}_3\text{C}_2\text{H}_4)\text{SiO}$ , and a copolymer including a first monomer and a second monomer, wherein the first monomer is selected from the group consisting of  $\text{C}_2\text{F}_4$ ,  $\text{C}_2\text{F}_3\text{Cl}$ ,  $\text{CH}_2\text{CF}_2$ ,  $\text{C}_2\text{H}_3\text{F}$  and  $\text{CH}_3(\text{CF}_3\text{C}_2\text{H}_4)\text{SiO}$ , and the second monomer is selected from the group consisting of  $\text{C}_2\text{H}_4$ ,  $\text{C}_3\text{H}_6$ ,  $\text{CH}_2=\text{CHOR}$  where R is a  $\text{C}_1$  to  $\text{C}_{20}$  alkyl group,  $\text{C}_3\text{F}_6$  and  $\text{CF}_2=\text{CFORf}$  where Rf is a  $\text{C}_1$  to  $\text{C}_{20}$  alkyl group with at least one fluorine atom.

19. (Original) The positive active material composition of claim 9, wherein the agent for controlling viscosity is selected from the group consisting of a cellulose-based polymer, polyvinyl alcohol, polyvinylpyrrolidone, polyacrylic acid, polyacrylamide, polyethyleneoxide, and polyethyleneimine.

20. (Original) The positive active material composition of claim 19, wherein the cellulose-based polymer is selected from the group consisting of methyl cellulose, hydroxypropyl methylcellulose, hydroxyethyl-cellulose, or carboxymethyl cellulose.

21. (Currently Amended) A lithium-sulfur battery, comprising:  
a positive electrode comprising a positive active material, a conductive agent, an agent for controlling viscosity, and a binder comprising a butadiene-based copolymer, wherein the binder is distributed in an organic solvent to form an emulsion, the binder having particle sizes of 15 micrometers or less;

a negative electrode; and  
an electrolyte.

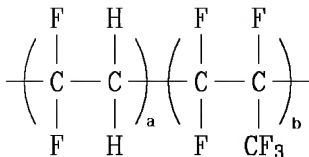
22. (Original) The lithium-sulfur battery of claim 21, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene copolymer, an acrylonitrile-butadiene copolymer, and a modified styrene-butadiene copolymer.

$$\begin{array}{c} \text{---}(\text{CH}_2-\underset{\text{CN}}{\text{CH}})_x\text{---}(\text{CH}_2\text{CH}=\text{CHCH}_2)_y\text{---}(\text{CH}_2-\underset{\text{C}_6\text{H}_5}{\text{CH}})_z\text{---} \\ (1) \end{array}$$

when  $x$ ,  $y$ , and  $z$  do not equal 0,  $x$  ranges from about 20 to about 75,  $y$  ranges from about 5 to about 20, and  $z$  ranges from about 20 to about 75.

26. (Original) The lithium-sulfur battery of claim 21, further comprising a fluorine-based polymer.

27. (Original) The lithium-sulfur battery of claim 26, wherein the fluorine-based polymer is represented by Formula 2:



(2)

and wherein a ranges from about 0.5 to about 1.0, and b ranges from about 0 to about 0.5.

28. (Original) The lithium-sulfur battery of claim 26, wherein the fluorine-based polymer is selected from the group consisting of a homopolymer prepared from monomers selected from the group consisting of  $\text{C}_2\text{F}_3\text{Cl}$ ,  $\text{C}_2\text{H}_3\text{F}$  and  $\text{CH}_3(\text{CF}_3\text{C}_2\text{H}_4)\text{SiO}$ , and a copolymer including a first monomer and a second monomer, wherein the first monomer is selected from the group consisting of  $\text{C}_2\text{F}_4$ ,  $\text{C}_2\text{F}_3\text{Cl}$ ,  $\text{CH}_2\text{CF}_2$ ,  $\text{C}_2\text{H}_3\text{F}$  and  $\text{CH}_3(\text{CF}_3\text{C}_2\text{H}_4)\text{SiO}$ , and the second monomer is selected from the group consisting of  $\text{C}_2\text{H}_4$ ,  $\text{C}_3\text{H}_6$ ,  $\text{CH}_2=\text{CHOR}$  where R is a  $\text{C}_1$  to  $\text{C}_{20}$  alkyl group,  $\text{C}_3\text{F}_6$  and  $\text{CF}_2=\text{CFORf}$  where Rf is a  $\text{C}_1$  to  $\text{C}_{20}$  alkyl group with at least one fluorine atom.

29. (Original) The lithium-sulfur battery of claim 21, wherein the agent for controlling viscosity is selected from the group consisting of a cellulose-based polymer, polyvinyl alcohol, polyvinylpyrrolidone, polyacrylic acid, polyacrylamide, polyethyleneoxide, and polyethyleneimine.

30. (Original) The lithium-sulfur battery of claim 29, wherein the cellulose-based polymer is selected from the group consisting of methyl cellulose, hydroxypropyl methylcellulose, hydroxyethyl-cellulose, or carboxymethyl cellulose.